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THE NAIADES OF MISSOURI.—VII.

BY WILLIAM I. UTTERBACK.

Eurynia (Micromya) lienosa (Conrad.)

("Little Spectacle Case.")

Pl. XXVII, Figs: 96 A—D.

1834—*Unio lienosus* Conrad, An. Jl. Sci., XXV, p. 339, pl. 1, fig. 4.

1900b—*Lampsilis lienosus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 547.

1912b—*Eurynia (Micromya) lienosa* (Conrad) Ortmann, An. Car. Mus., VIII, pp. 340 and 341.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with two-ranks of papillae; anal crenulated; supra-anal high, small, closely connected by mantle edges to anal; inner laminae of inner gills more or less free from the visceral mass; palpi subfalcate connected antero-dorsad about one-half of their length; color of soft parts soiled white except mantle edge of siphonal area blackish, gills brownish.

REPRODUCTIVE STRUCTURES:—Marsupium kidney-shaped, restricted to posterior half of outer gill, consisting of twenty-five distinct ovisacs, which, when gravid, distend transversely in middle and ventrad as white beadlike bodies; inner mantle edge of females antero-ventrad to branchial opening with eight to ten conical tentacles rather wide apart and reaching a little over half way centrad-ventrad; conglomerates large, club-shaped; glochidia large, subovate, measuring 0.220 x 0.270 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, elliptical, moderately inflated, thick; post-umbonal ridge rounded; disk smooth; umbones low sculptured with inverted V-shapes; epidermis reddish brown with dark banded rays; female shell expanded post-ventrad, male rather biangulated behind.

INTERNAL STRUCTURES:—Cardinals double in left, single in right valve; laterals also double in left, single in right; inter-dentum lacking; beak cavities moderately deep; nacre purplish with old gold and copper-color in branchial cavity.

Sex	Length	Height	Diameter	Locality
♀	53	x 30	x 21.5mm	(Black R., Williamsville)
♂	50	x 30	x 20.0mm	(" " ")
♂	42	x 26	x 17.0mm	(" " ")
♀	29	x 18	x 11.0mm	(" " ")

MISCELLANEOUS REMARKS:—In the young shell of the last measurement the beaks were sculptured with inverted V-shaped ridges similar to that of *subrostrata*. This species is only found in the Black River for this State. Rev. Wheeler considers *lienosa* as intergrading with *nigerrima* and while the two are usually found in the same locality yet *nigerrima* is more likely to occur as a creek form. The writer obtained some gravid August 29 with late embryos. The young one of the above measurement was gravid and, as preserved, shows many characters like that of *subrostrata* but can be separated on account of an insufficient development of mantle edge antero-ventrad to branchial opening.

Eurynia (Micromya) iris (Lea.)

("Rainbow Shell.")

Pl. XXVII, Figs. 97 A and B.

1830—*Unio iris* Lea, Tr. Am. Phil. Soc., III, p. 439, pl. IX, fig. 18.

1898—*Lampsilis iris* Baker, Moll. Chicago, Pt. I., p. 105, pl. XIII, fig. 1; pl. XIV, fig. 2.

1912b—*Eurynia (Micromya) iris* (Lea) Ortmann, An. Car. Mus., VIII, p. p. 341 and 342.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal crenulated; supra-anal large, closely connected to visceral mass; palpi small, one-half connected antero-dorsad; color of soft parts dark tan with posterior part of gills and mantle blackish.

REPRODUCTIVE STRUCTURES:—Marsupia composed of twenty closely crowded ovisacs occupying post-half of outer gills; inner mantle edge fringed with eight or ten papillae, the most anterior ones reaching well toward the center of ventral edge where they are larger, postero-curved and terminating in small low papillae near the branchial opening—all rather wide apart; glochidia rather large, subovate measuring 0.240 x 0.300 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, elongate-elliptic, thin, dorsal line slightly curved, ventral straight; compressed anteriorly inflated in center of post-umbonal ridge; beaks pointed but low, sculptured by seven or eight double-looped ridges; epidermis

smooth reddish-brown with bright green rays arranged all over its shell.

INTERNAL STRUCTURES:—Cardinals double in both valves, laterals double in left, single in right; beak cavities rather shallow; nacre white or light bluish.

Sex	Length	Height	Diameter	Locality
♂	45	x	22 · x	15mm (Jack's Fork of Current R.)
♀	35	x	18 x	10mm (White R., Hollister)
♀	34	x	16 x	11mm (Black R., Williamsville)
♂	22	x	12 x	7mm (Jack's Fork of Current R.)

The last measurement is that of a young shell that shows a beak sculpture of a profusely double-looped or corrugated ridges the latest one being the strongest and running down quite low on the disk.

MISCELLANEOUS REMARKS:—For this State *iris* is strictly a southern shell, being only found in the White and Black River basins. Perhaps this pretty little shell is much more common than supposed, since it is so liable to escape observation due to its minuteness of size yet its bright green rays of uneroded shells make it rather conspicuous in clear shallow water. It has been found to be bradytictic.

Eurynia (Micromya) brevicula (Call).

("Broken Rays," "Soul-of-Wit.")

Pl. XXVII; Figs. 98 A—D.

1887—*Unio breviculus* Call, Pr. U. S. Nat. Mus., X, p. 499; pl. XXVIII; Tr. Ac. Sci. St. Louis, VII, (1895) p. 6, pl. XVI.

1900b—*Lampsilis breviculus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 533.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Branchial opening densely papillose; anal crenulated; supra-anal large, high, well separated from anal with thick, spotted mantle edges; inner laminae of inner gills not free from visceral mass; palpi rather large, connected by their edges one fourth of their length antero-dorsad.

REPRODUCTIVE STRUCTURES:—Marsupium rather kidney-shaped consisting of ten or fifteen ovisacs well separated, with bluish ventral border and each ovisac presenting a beaded appearance of black pigmented spots; in female mantle border antero-ventrad to branchial opening with a flap-like structure bearing eight

or ten papillae terminating toward the center of ventral border with longer finger-like tentacles; glochidium unknown, but is identical doubtless with that of its sub-species, *Brittsi*.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elliptical, medium in size, usually rather thin, evenly rounded before; post-umbonal ridge not present; beaks large but low sculptured by six inverted V-shaped ridges with their apices pointing toward the tips of the beaks and with the posterior ridges extending out as longer and more oblique rows at the base of the post-ridge region; epidermis smooth, shiny, straw-color with coarse broken rays most pronounced posteriorly.

INTERNAL STRUCTURES:—Cardinals erect, double in left, single in right valve; interdentum narrow; laterals double in left, single in right, blade-like; beak cavities rather deep and base-like; nacre bluish or whitish with tinge of pink in umbonal cavities.

Sex	Length	Height	Diameter	Locality
♂	64	x	40	x 27 mm—(White R., Hollister)
♀	55	x	47	x 22.5 mm—(" " ")
♀	51	x	40	x 23 mm—(" " ")
♂	40	x	25	x 18 mm—(" " ")

MISCELLANEOUS REMARKS:—This species is strictly a S. Mo. shell and its sub-species is only found in Central Missouri. Some of the South Missouri streams bear *brevicula* that almost approach *Brittsi*; however, *brevicula* is a rather common shell in the streams of the south slope of the Ozarks, where it is typical. Young shells of this species are very thin, while the adult shells become very thick comparatively. Perhaps this species exhibits sexual dimorphism more than any of this genus. The female had a much broader, shorter more inflated shell than the male; the latter being more or less biangulated behind. The slightly long incurved post-ventral portion of the female shell is very characteristic. Gravid females are unknown. *Brevicula* is the largest, most emphatic member of the *Micromya* group.

Eurynia (Micromya) brevicula Brittsi (Simpson).

("Britts' Shell.")

Pl. XXVII; Figs. 99 A and B.

1900a—*Lampsilis brittsi* Simpson, Pr. Ac. Nat. Sci. Phila., p. 76, pl. V., fig. 1 and 2; 1900 b, U. S. Nat. Mus. Pr., XXII, p. 533.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with large yellowish papillae; anal crenulated; supra-anal moderately separated from anal by distinct mantle connection; gills wide, the inner slightly longer and wider, the inner laminae connected with the visceral mass their entire length; palpi wide and large, united one fourth of their length antero-dorsad; color of soft parts tan-color except foot which is more yellowish and mantle edge which is black for the siphonal openings.

REPRODUCTIVE STRUCTURES:—Marsupia wide, more or less reniform, consisting of about a dozen large distinct ovisacs, distended, when gravid, transversely in center and along the ventral edge into black pigmented beads at the distal ends; conglomerates white, rather club-shaped; *glochidia moderately large, semi-elliptical, hinge line slightly oblique and undulate measuring 0.250x0.305 mm.*; mantle edge antero-ventrad to branchial opening with a flap extending toward the center of ventral margin with about ten papillae beginning rather low at edge of branchial opening and ending with tentacular processes at end.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell medium in size, thick to thin, subelliptical; post-umbonal ridge lacking; beaks large but low-sculptured by six inverted V-shaped ridges the posterior ones being longer and thrown more or less obliquely across post-umbonal slope; disk without sculpture; male shell rounded before, rounded and more or less biangulated behind; female shell very deeply and widely sulcated at the post-ventral margin of shell and is less elliptic in general outline, also thicker and more inflated than male shell; epidermis yellow to olivaceous with broad, widely separated rays of interrupted lunate or V-shaped splotches—all covering the whole shell.

INTERNAL STRUCTURES:—Cardinals stout, double in left, single in right valve; interdentum long, narrow; laterals short somewhat curved reaching far back; beak and branchial cavities rather deep and basin-like; scars well impressed; nacre white, pinkish and iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♀	64	x	40	x 27mm—(Niangua R., Hahatonka)
♀	55	x	36	x 25mm—(" " ")
♂	40	x	24	x 14mm—(" " ")

The peculiarity of the shell of this sub-species (as well as that of the species) is that the younger the shell the very much thinner. It is also more brilliantly tawny and green rayed.

MISCELLANEOUS REMARKS:—Surely this form of *brevicula*, found by the writer in its type locality, Niangua River, has enough peculiar characters to entitle it to a good species, as Simpson had first considered it. Its special characteristic is the very wide, deep emargination in the female shell at its post-ventral margin. However, it is almost identical with its parent species as to its soft parts. Its tentacled lamellar-like flap on the mantle edge antero-ventrad to the branchial opening is somewhat like that of *ventricosa* and hence might be grouped under the *Lamp. luteola* group; however, the smaller papillae along the posterior end of the flap (or rather thickened mantle edge) would class it more as an *Eurynia*. *Brittsi* is to be distinguished from its parent by the *greater post-ventral sulcus* (Fig. 99), which extends in as a rather deep radial furrow for a short distance forming the greatest inflation of the shell in front of this. It also differs in shell characters from the female species (*brevicula*) in not being so broad posteriorly and not as rounded post-dorsad. Dr. Britts collected the originals from Niangua River and sent them to Simpson for naming; hence the consequent name of this species. Cotypes (now in the hands of the writer and illustrated herewith) collected from almost the same point in the Niangua show a decided difference from cotypes of Call's *brevicula* many of which are now in the writer's collection, through the kindness of Mr. B. F. Bush, one of the most active students and collectors of *Naiad* shells now living in this State. This sub-species is bradytictic as inferred from the writer's brief breeding record. He has had the good fortune to *collect the glochidia of this form for the first time*. In all probability this glochidium is the same as that of Call's *brevicula*. However, its breeding season seems to be a little different as the writer collected many of the species only a day or two later to find them all sterile.

Sub-Genus *Eurynia* (Sens. Strict.) Rafinesque.

1912b—*Eurynia* (as sub-genus), Ortmann, An. Car. Mus., VIII, p. 338.

(Type, *Unio recta* Lamarck.)

ANIMAL CHARACTERS:—Differs from those of *Micromya* in the structure of its rough mantle edge antero-ventrad to branchial opening being more differentiated into a greater number and longer

row of papillae on the inner edge extending down quite to the central part of the ventral edge. These papillae are often quite tentacular and are rather regular and uniform in shape and size and are never widely separated as in case of the *Micromya* mantle edge of this anterior branchial border. Its inner laminae of the inner gills are usually entirely connected with the visceral mass; however, a small hole is sometimes left at the posterior end post-dorsad to foot.

SHELL CHARACTERS:—In shell characters there are no great distinctions to be considered as a group since the chief distinguishing characteristic is in the post-mantle edge as above discussed. Its beak sculpturing is identical with that of the *Micromya* shell being sinuated or double-looped, the posterior loops being more or less broken behind.

This group of *Eurynia* is represented in this State by *E. (E) subrostrata* and *recta*, both having rather wide distribution.

***Eurynia (Eurynia) subrostrata* (Say).**

("Common Pond-Mussel," "Lilliputian.")

Pl. XXVII; Figs. 101 A—D.

1831—*Unio subrostratus* Say, New Harm. Diss.

1850—*Unio mississippiensis* Conrad, Jl. Ac. N. Sci. Phila., 1, p. 277, pl. XXXVIII, fig. 11.

1868—*Unio topekinsis* Lea, Pr. Acad. Nat. Sci. Phila., XII, p. 144.

1900b—*Lampsilis subrostratus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 546.

1912b—*Eurynia (Eurynia) subrostrata* (Say), Ortmann, An. Car. Mus., VIII, p. 344.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening narrowly papillose; anal finely papillose supra-anal separated from anal by a rather short mantle connection; inner laminae of inner gills connected to visceral mass; palpi rather small and connected antero-dorsad about one-fourth of its length; color of soft parts grayish with mantle edge along siphonal region blackish.

REPRODUCTIVE STRUCTURES:—Marsupia kidney (or rather) fan-shaped, consisting of twenty large, well defined ovisacs, distended, when gravid, at ventral edge thus giving the conglomerates a club-like shape; ventral tips of ovisacs beaded bearing bluish pigment with glochidia scattered throughout the sacs;

glochidia rather large, semi-elliptical, spineless, regularly rounded ventrad, hinge-line straight, measures 0.270 x 0.330 mm.; mantle edge antero-ventrad to branchial opening in female with numerous regular papillae extending quite down to the central part of ventral border.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small to medium in size, rather elongate-elliptic, thin, compressed; post-umbonal ridge rounded; female shell very wide and blunt posteriorly, male pointed and narrow; umbones low, sculptured by eight or ten coarse, regular, inverted V-shaped ridges with the apices pointed toward tips of beaks, the posterior ridges longer and more disposed obliquely across base of post-ridge; disk without sculpturing; epidermis brown to black with many rays disposed posteriorly and showing through on the nacreous surface.

INTERNAL STRUCTURES:—Cardinals double in both valves, rather thin and erect; laterals thin, double in both valves; scars rather well impressed; beak and branchial cavities rather deep and hollowed out; nacre white to light bluish iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♂	62	x	27	x 21.5mm—(Flat Creek, Sedalia).
♀	65	x	36	x 25.5mm—(Hinkston Creek, Columbia)
♂	50	x	28	x 15.5mm—(Lost Creek, Amity)
♀	36	x	18	x 13.5mm—(Flat Creek, Sedalia)

This last measurement is for one that has preserved soft parts and although it is very young and small yet it is gravid with normal glochidia. Its beak sculpture is very distinct as shown above in the description of shell character.

MISCELLANEOUS REMARKS:—*Subrostrata* is a creek and pond shell, but in spite of this lacustrine disposition it is never found in any of the North West Missouri lakes. Like *U. tetralasma* it adjusts itself easily and quickly to artificial ponds and channels. It is never found in large rivers nor swift streams. It has a general distribution over the State, especially in the ponds and quiet creeks of Central part. Simpson gives it a general distribution over the entire Mississippi drainage north of about latitude 41°. The breeding season of *subrostrata* is a long one. Its glochidia seem to be very constant in size for widely separated localities. Comparisons have been made of glochidia from mussels of Central Missouri

sculptured by fine concentric ridges disposed somewhat like that of with those from the Mississippi to find them precisely identical in every respect.

Eurynia (Eurynia) recta (Lamarck).¹

("Spectacle-Case," "Black Sand Shell.")

Pl. XXVII; Figs. 100 A—D.

1819—*Unio recta* Lamarck, An. Sans. Vert., VI, p. 74.

1823—*Unio praelongus* Barnes, Am. Jl. Sci., 1st ser., VII, p. 261, fig. 11.

1900b—*Lampsilis rectus* Simpson, Pr. U. S. Nat. Mus., XXII, pp. 544–545.

1912b—*Eurynia (Eurynia) recta* (Lam.) Ortmann, An. Car. Mus., VIII, p. 344.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with numerous papillae; anal finely crenulate; supra-anal separated from anal by moderate mantle connection; inner laminae of inner gills connected to visceral mass; palpi small, almost entirely free along their antero-posterior edges; color of soft parts grayish with its posterior mantle border blackish or reddish brown.

REPRODUCTIVE STRUCTURES:—Marsupium rather kidney-shaped consisting of fifty large ovisacs extending below the original ventral line into thickened, cream-colored, cone-shaped beads when gravid; ova lying in irregular masses within the sacs; mantle edge antero-ventrad to branchial opening specialized with very great number of large, densely crowded papillae extending entirely to the center of the ventral edge; conglutinates white, glochidia rather medium in size, semi-elliptical, spineless, rounded ventral edge, hinge line undulated, measure 0.220 x 0.280 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Elongate-elliptic, heavy, rather thick, large; female shell broader and more blunt posteriorly than male; no post-umbonal ridge; disk smooth; beaks large, low sculptured by fine concentric ridges disposed somewhat like that of

¹ This Species is the most generally distributed of the *Lampsilinae*. (See accompanying Map (Plate XXIX) for three other generally distributed Species; viz., *Cumberlandia monodonta* (Say) as representative of *Margaritanidae*, *Quadrula verrucosa* (Raf.) of *Unioninae* and *Strophitus edentulus* (Say) of *Anodontinae*.

subrostrata; epidermis black, glossy, rayed with broad reddish stripes.

INTERNAL STRUCTURES:—Cardinals very long and stout, double in both valves; laterals long, somewhat pointed in male, more or less horizontal in female; nacre usually rich purple but is variable to white, or the two colors may be present for the same individual.

Sex	Length	Height	Diameter	Locality
♂	125	x	53	x 31mm—(Black R., Williamsville)
♀	109	x	48	x 30mm—(Osage R., Osceola)
♂	96	x	40	x 25mm—(Gasconade, Gascondy)
♀	78	x	30	x 18mm—(White R., Hollister)

MISCELLANEOUS REMARKS:—No juvenile shells are at hand. Adolescent shells of *recta* are even difficult to obtain. *Recta* is not a variable shell for this state; even in nacre-color it is rather constant—being more purple in Central Missouri and white in South and Southwest Missouri streams. This species has one of the widest distributions in the state; however, it is seldom found in the North Missouri streams. It is strictly fluviatile. According to Simpson it has a very general distribution over the United States, although it is not very common in its individual occurrence anywhere. The predominance of one sex over another in this species for the same stream is more noticed than in any other. Probably this occurrence is due more to breeding season than to any other cause. The writer notes from his own record, and that of others, that this species is bradytictic.

Surber (1913, p. 109) finds that the occasional host for *recta* to be the sunfish (*L. pallidus*).

Genus *Lampsilis* Rafinesque.

1820—*Lampsilis* Rafinesque, Monog., Ann. Gen. Sci. Phys.

Brux. p. 298; 1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 526.

(Type, *Unio ovatus* Say.)

ANIMAL CHARACTERS:—Branchial and anal opening papillose; supra-anal not very large, separated from the anal by a moderate connection; inner laminae of inner gills connected to the visceral mass, sometimes a small hole is left post-dorsad of foot; marsupium usually kidney-shaped, distended, consisting of many ovisacs which are distinct, extended below original edge of sterile marsu-

pium when gravid into blunt, pigmented beads; mantle edge double posteriorly, the inner one antero-ventrad to branchial opening developed into a ribboned flap usually produced into a tentacled lobe at its end located about the lowest post-ventral point; conglutinate not solid; glochidia rather large, subelliptic.

SHELL CHARACTERS:—Shell elliptical to ovate; disk smooth; beaks sculptured by the sinuate or double-looped type, sometimes with a tendency of the posterior loop to become broken; epidermis usually smooth, thin and shiny often brilliantly rayed. Hinge with two cardinals and two laterals in left and two cardinals and one lateral in the right valve; female shell with an inflation at the post-ventral region of shell just over the marsupia.

MISCELLANEOUS REMARKS:—The differentiation of the mantle antero-ventrad to branchial opening into a flap marks this genus as among the highest of the *Lampsilinae*. This flap is so developed with tentacles and papillae that it is often extended externally and waved to and fro so as to produce almost the best possible aëration for the embryos. This genus is represented in this State by five species which have a good general distribution.

Lampsilis anodontoides (Lea).¹

("Yellow Sand Shell," "Lady's Finger.")

Pl. VIII, Figs. 17 A and B; Pl. XXVIII, Figs. 102 A—D.

1834—*Unio anodontoides* Lea, Tr. Am. Phil. Soc., IV, p. 81, pl. VIII, fig. 11.

1834—*Unio teres* Say, Am. Conch., VI; 1820, Rafinesque, Monog.

1898—*Lampsilis anodontoides* Baker, Moll Chicago, Pt. I, p. 100, pl. X, fig. 1.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening rather small directed upward; anal crenulated; supra-anal high well separated by mantle edges from anal; inner laminae of inner gills connected to visceral mass; palpi long, falcate, connected for one-half of their length antero-dorsad; color of soft parts grayish except brownish red mantle border at branchial opening.

From Rafinesque's evident description of this Species in the Supplement to his Monograph of 1820 under *Unio teres* (*Elliptio teres*) Lea's name, as given here by Simpson, (1900b, p. 543,) should stand as a synonym for *Lampsilis teres* (Raf.).

REPRODUCTIVE STRUCTURES:—Marsupium rather reniform occupying over posterior half of outer gills and consisting of sixty-five ovisacs well separated, when gravid extending below original ventral edge of sterile marsupia; inner mantle edge antero-ventrad to branchial opening a specialized flap reaching down to lowest point of the post-ventral part of shell where it is developed into a tentacular lobe; conglutinates white, sole-shaped, not very solid, glochidia medium in size, sub-elliptical, spineless, hinge line rather short, evenly curved, measuring 0.185 x 0.210 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elongate-elliptic, medium in size, subsolid, disk smooth; umbones large, but not full, sculpture by five or six double looped or sickle-shaped ridges most pronounced and opened at base of post-umbonal slope; epidermis straw-color (usually without much display of rays) smooth, polished; female shell much produced at the post-ventral edge of shell and continued upward as a marsupial inflation for a short distance; male shell pointed posteriorly.

INTERNAL STRUCTURES:—Cardinals prominent, serrate, double in right valve, single in left; beak and branchial cavities rather deep and basin-like; nacre satin-white, iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♂	120	x	60	x 45mm—(Chariton R., Kern)
♀	100	x	50	x 38mm—(Miss. R., Hannibal)
	50	x	23	x 16mm—(Grand R., Darlington)
	12.5	x	6	x 5mm—(Grand R., Utica)

The last measurement was that of one of the smallest juveniles obtained by the writer. It has a black border to its shell and a short byssus extending from between the valves at ventral portion of shell.

MYCELLANEOUS REMARKS:—Even in the juvenile *anodontoides* there is some difference from that of the *fallaciosa* shell in that there are not as evident. The main distinction between the adult shells of these two species is that of *fallaciosa* is brilliantly rayed, is smaller, has more reddish beaks and is a dweller in muddy creeks, sloughs and lakes while *anodontoides* loves sandy situations of swifter water and develops a large, thick shell, rayless, unicolored epidermis and is a most active mussel. When perfect (as it is found in the Chariton and Mississippi Rivers) it is one of

the most beautiful shells. It is strange that it should not be found anywhere in the Ozarks as it seems to be a mussel that rather prefers swift current. Yet as that is an unglaciated region without much sand, to which it is partial, we may account for its absence there in part. It is entirely supplanted in the Osage by *fallaciosa*. From the writer's breeding record for this species it is bradytictic.

***Lampsilis fallaciosa* Smith.**

("Slough Sand Shell," "Creeper.")

Pl. VII, Figs. 18 A and B.

1899—*Lampsilis fallaciosa* Smith, Bull. U. S. Fish., p. 291, pl. LXXIX;
1900a, Simpson, Pr. Ac. N. Sci. Phila., p. 74, pl. II, fig. 5.

ANIMAL CHARACTERS:—Identical with *L. anodontoidea* in every respect, except perhaps in glochidial characters.

SHELL CHARACTERS:—Differs from *anodontoidea* in possessing a smaller, lighter, thinner shell; a more prominent post-umbonal ridge; more pronounced beak sculpture; pinkish nacre in umbonal cavity; bright yellowish, or olivaceous epidermis with bright green rays all over shell—especially on the posterior slope; rusty red color often for umbonal region; a sulcus often seen just anterior to the post-ventral edge and extending a short distance up on the shell as a radial furrow.

Sex	Length	Height	Diameter	Locality
♂	94	x	45	x 28 mm—(Lower L. Contrary, St. Joseph)
♀	64	x	30	x 21 mm—(Chariton R., Kern)
♀	64	x	31	x 21 mm—(Miss. R., Hannibal)
	51.5	x	24.5	x 15 mm—(Osage R., Warsaw)
	14	x	7.5	x 5.5 mm—(Grand R., Chillicothe)

The last measurement is that of a juvenile identified by Dr. Howard. Its beaks are sculptured by two or three subparallel ridges at the base of the post umbonal slope and a few very faint tubercles at the base of the anterior umbonal slope. Anterior end of the shell is greatly produced as noted in most juvenile shells of any species. Note the very small inflation in the above measurement. It is strange that this shell at this stage of its life should be practically rayless while the rayed character of the adult shell is its chief feature.

MISCELLANEOUS REMARKS:—*Fallaciosa* may have developed from *anodontoidea* for ecological reasons. This little striped shell

is a dweller along the edges of muddy streams or in ponded stretches of the rivers and prefers lacustrine situations. For that reason it is commonly known as "Slough Sand Shell," and "Creeper." Mr. Walker makes the assertion that typically these two species are very distinct, but that it is frequently difficult to name individual specimens so given are they to intergrading. The fact, too, that both forms are found in the same stream (as in the Chariton R., for instance) and apparently entirely distinct would go to show that they are specifically distinct. Besides Surber (1912, p. 5) states a difference in size of glochidia, those of *fallaciosa* being larger (0.200 x 0.240 mm.) than those of *anodontoides* (0.185 x 0.210 mm.).

Surber (1913 p. 107) also reports that this species (*fallaciosa*) has for its fish host the crappie (*P. platyrhynchus*) its glochidium being a gill parasite.

Lampsilis Higginsii (Lea).

("Higgin's Shell.")

Pl. XXVIII, Figs. 105 A and B.

1857—*Unio higginsii* Lea, Pr. Ac. N. Sci. Phila., IX, p. 84.

1900b—*Lampsilis higginsii* Simpson, Pr. U. S. Nat. Mus., XXII, p. 540.

ANIMAL CHARACTERS:—As only dead shells of this species have been secured by the writer no description of the soft parts can appear here. Surber (1912 p. 9) reports its glochidium as sub-elliptic, spineless, with hinge line short and measures 0.210 x 0.260 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell very thick; male sub-elliptic; female subrhomboid with posterior end vertically truncate; beaks very large, rounded, full, sculpture unknown; epidermis brownish-red with rays.

INTERNAL STRUCTURES:—Cardinals large, erect; laterals straight in female; slightly curved in male shell; interdentum wide, thick; beak cavities deep; scars deep; nacre rosy pink to salmon.

Sex	Length	Height	Diameter	Locality
♂	86	x 63	x 45mm—	(Mississippi R., Hannibal)
♀	68	x 50	x 38mm—	(" " ")
♂	85	x 48	x 48mm—	(" " Louisiana)

MISCELLANEOUS REMARKS:—According to Simpson this is a puzzling species that closely resembles *O. ellipsis* in outline and its great posterior truncation and post-ventral inflation of the female shell would seem to be characteristic enough to make it a good species. Male shells obtained from the Mississippi River of this State, in the hands of the writer, look more like *N. ligamentina* than anything else, yet its cardinals are more stumpy, is a thicker heavier shell and has a rosy nacre. This State is within its range, as its distribution is from Iowa to Kansas. Surber reports "Sauger" (*S. canadense*) as its fish host.

Lampsilis Powellii (Lea).

("Powell's Shell.")

Not figured.

1852—*Unio powellii* Lea, Pr. Am. Phil. Soc., V., p. 252; Tr. Am. Phil. Soc., X, p. 270, pl. XIX, fig. 25.

This species is listed for Missouri through a report by Mr. Frierson from a collection made by F. A. Sampson for the Elk River, McDonald Co., this State. Since no specimens are at hand the writer can give no description except that for the shell quoted from Scammon (1906, pp. 288 and 289).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—"Shell large, rather thin, elliptical in outline, neither inflated nor compressed. Anterior margin almost circularly rounded; ventral margin gently and evenly bowed; posterior margin rounded, biangulated; dorsal margin rather long and straight. Umboidal ratio in specimens examined, 0.20., umbones rather flattened. Anterior and lateral slopes flattened and rounded; posterior slope very slightly excavated and marked with two radial lines. Epidermis smooth and generally shining, olive-brown. Ligament long and rather thick.

INTERNAL STRUCTURES:—"Pseudo cardinals small, serrate, rather bluntly pointed, single in right valve and double in left. Laterals long, slightly curved, lamellar. Interdentum long, narrow, rounded. Anterior adductor cicatrix well impressed, large, much longer than wide; posterior scars large, very slightly impressed, confluent. Dorsal cicatrices on the lower surface of the interdentum. Pallial line well impressed in its one-half and crenulate. Cavity

of beaks deep, of the shell moderately deep. Nacre white, decidedly iridescent posteriorly."

Dr. Scammon reports *Powellii* as a very rare shell for Kansas, being found in only one locality, Spring River, Baxter Springs, and further states that this species may be distinguished from *L. luteola*, its nearest ally in local waters, by the smaller and less pointed cardinals and the thinner, squarer and less inflated shell. Simpson states that *Powellii* is also found in Salina and Clinton, Arkansas, and in Guadalupe River, Texas. The fact that Mr. Simpson found this rare shell in the Neosho basin of this State its range is more determined.

***Lampsilis luteola* (Lamarck).**

("Fat Mucket.")

Pl. XXVIII, Figs. 103 A—F.

1819—*Unio luteola* Lamarck, His. Sans. Vert., VI, p. 79.

1898—*Lampsilis luteola* Baker, Mol. Chicago, Pt. I, p. 103, pl. XI, fig. 12; pl. XXXVII, fig. 12.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with numerous papillae; anal slightly crenulated; supra-anal well separated by thick mantle connection; inner laminae of inner gills connected to visceral mass; palpi short, wide; color of soft parts dingy white, mantle border blackened posteriorly.

REPRODUCTIVE STRUCTURES:—Mantle edge antero-ventrad to branchial opening with long spotted flap at the end of which are two or three finger like tentacles and about midway an eye spot appears; marsupium large, kidney-shape, consisting of numerous distinct ovisacs that hang down toward the mantle flap in beaded rows; conglutinates white, large, subsolid; glochidium rather large (uniformly smaller for lacustrine *luteola*), subelliptic, spineless, measuring 0.250 x 0.290mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell broadly elliptic, narrowly rounded before, broadly rounded behind; female shell greatly inflated, rather truncated posteriorly expanded post-ventrad, male shell pointed posteriorly; disk smooth; umbones large but low,

sculpture faint consisting of fine broad, inverted V-shaped lines with the apices pointing toward tips of beaks; epidermis yellowish or olivaceous with widely separated and interrupted rays.

INTERNAL STRUCTURES:—Cardinals double in left, single in right; laterals doubled the same; nacre white.

Sex	Length	Height	Diameter	Locality
♀	110	x 65	x 48mm—	(Flat Creek, Sedalia)
♂	130	x 68	x 48mm—	(" " ")
♀	82	x 46	x 30mm—	(Black R., Williamsville)
♂	54	x 30	x 17mm—	(White R., Hollister)

MISCELLANEOUS REMARKS:—Although *L. luteola* is considered as having the greatest geographical distribution over all United States yet (strange to say!) it has limited distribution in Missouri. It is not found at all in North Missouri, occurs very sparingly for Central Missouri, (especially in the Osage basin) and is not at all typical for South Missouri. The best types are found in Crow's Fork, Fulton, and in Flat Creek, Sedalia, where the female shells attain enormous size and thickness—the typical "Fat Mucket," as it is known on the market. Surber finds that the glochidia of *luteola* attain a larger size in the fluviatile forms (1912, p. 4) and thinks that the larger size of the river form may be correlated with the larva. *Luteola* is bradytictic.

***Lampsilis luteola rosacea* (DeKay).**

("Rosy Mucket.")

Pl. XXVIII, Figs. 104 A and B.

1843—*Unio rosaceus* DeKay, Zool. of New York, V., p. 192, pl. XXXIV, figs. 355 and 356.

1900b—*Lampsilis luteolus rosaceus* (DeKay) Simpson, Pr. U. S. Nat. Mus., XXII, p. 535.

ANIMAL CHARACTERS:—No soft parts have been seen but in all probability identical with those of the parent.

SHELL CHARACTERS:—Identical in all respects with the parent species except in its solid pink nacre.

Sex	Length	Height	Diameter	Locality
♂	125	x 72	x 49mm—	(White R., Hollister)
♀	90	x 52	x 37mm—	(Black R., Williamsville)

MISCELLANEOUS REMARKS:—A cotype from a lot of pink-nacred shells collected by the writer in the White and Black

Rivers was pronounced by Mr. Frierson as *rosacea* DeKay but not exactly the author's shell from the St. Lawrence. Mr. Walker comments:—"I do not remember of ever having seen a red-nacred *luteola* from the southwest. The Great Lakes form, *rosacea* DeKay, is typically red or rather pink."

***Lampsilis reeviana* (Lea).**

("Reeve's Shell.")

Not figured nor described.

1852—*Unio reevianus* Lea, Tr. Am. Phil. Soc., X, p. 272, pl. XX, fig. 28.

This species is catalogued through a report of it for Clinton, Missouri. The writer has not found it; hence no figure nor description appears here. Simpson reports this throughout the Southwest and hence the locality of this State, from which Mr. Walker reports as having received his *reeviana* shell, is within the range.

***Lampsilis ventricosa* (Barnes).¹**

("Pocket Book.")

Pl. XXVIII, Figs. 106 A—D.

1823—*Unio ventricosus* Barnes, Am. Jl. Sci., VI, p. 267, pl. XIII, fig. 14. (in outline).

1900b—*Lampsilis ventricosus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 351.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial and anal opening papillose; supra-anal large, closely connected to anal; inner laminae of inner gills connected to visceral mass; palpi connected about two-thirds of their length antero-dorsad, color of soft parts whitish except foot which is pinkish and gills of male and sterile female which are light brown, gravid marsupium darker brown, edged in blue and black.

REPRODUCTIVE STRUCTURES:—Marsupium kidney-shaped con-

¹ According to Vanatta, l. c., (1915, p. 551), *Lampsilis ventricosus* Bar. (1823) of Simpson's Synopsis, p. 526, should read *Lampsilis cardium* Raf. since this Species is unquestionably the *Lampsilis cardium* (*Unio cardium*) of Rafinesque's Monograph (1820), p. 298, No. 14, Pl. 80, Figs. 16, 17, 18 and 19, as now identified from Types in the A. N. S. P. Coll., No. 20, 210.

sisting of thirty large ovisacs distended, when gravid, at their distal ends into bulging beads drawn down near to mantle flap which is a long, wide, ragged ribbon that bears eye spots and extends to bend of the post-ventral curve of the shell; conglomerates white, discharged in unbroken masses; glochidia medium in size, semi-elliptic, with rather straight hinge line, measuring 0.205 x 0.255mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell of female sub-rhomboidal greatly inflated, swollen post-ventrad, male sub-elliptic not so inflated; narrowly rounded before, disk smooth, without sculpture; beaks very full, very much inflated, sculptured by four coarse sub-parallel bars with rounded furrows between; epidermis thin, smooth, polished, yellowish, bluish olivaceous or even terracotta, with broad brilliant green, or blue-green rays all over shell; post-umbonal ridge prominent but not angled.

INTERNAL STRUCTURES:—Cardinals prominent, serrate, rather curved; laterals erect blade-like; beak cavities very deep and basin-like; nacre pure marble white, sometimes inclined to pink.

Sex	Length	Height	Diameter	Locality
♀	100	x 65	x 45mm—	(Gasconade R., Gascondy)
♂	90	x 65	x 42mm—	(Black R., Williamsville)
♂	110	x 39	x 26mm—	(Osage R., Osceola)
♀	55	x 39	x 26mm—	(Miss., R., La Grange)

The young shells are very bright colored. The specimen of the last measurement has a blue epidermis with bright blue-green stripes. Its beak sculpture is very plain and eroded in curved beaks showing as above described. No juveniles obtained.

MISCELLANEOUS REMARKS:—Young shells look much like *multiradiata* but can be distinguished from the latter by the presence of post-umbonal ridge and by not possessing so many finer rays. The adult shell is told from that of *ovata* by not possessing the sharp cornered post-ridge, larger shell and more peculiar rays. Aside from these two related shells *ventricosa* is unique. *Multiradiata* and *ovata* are not found in Missouri. *Ventricosa* is also very peculiar in the structure of its soft parts—especially in the great development of the mantle flap that characterizes the genus *Lampsilis*. The writer has observed these flaps extended and in action both in the aquarium and in nature. Three have been seen

spawning, at which time the mother buries her shell in the sand up to the siphonal openings, the flaps are waved to and fro exposing the ventral edges of the ovisacs through the branchial opening while ever now and then sole-shaped conglutinates emerge from the anal opening by convulsive jerks. With the eye spots showing at the base and the fringed flaps rhythmatically waving one is fascinated. *Ventricosa* is found to be typically bradytictic. The geographic distribution for Missouri is wide; however, it is of rare occurrence in the streams of North Missouri—never found in Northwest Missouri. South of the Missouri it is one of the commonest of shells.

***Lampsilis ventricosa satura* (Lea).**

("Plain Pocket Book.")

Pl. XXVIII, Figs. 107 A—B.

1852—*Unio satur* Lea, Pr. Am. Phil. Soc., V., p. 252; Tr. Am. Phil. Soc., X. 1852, p. 205, pl. XXVII, fig. 19.

1900b—*Lampsilis ventricosus satur* (Lea) Simpson, Pr. U. S. Nat. Mus. XXII, p. 527.

ANIMAL CHARACTERS:—Identical in every way to the parent species.

SHELL CHARACTERS:—Also identical to the species except in its uni-coloration of epidermis which is rather a dark-brownish. All shells collected by the writer for this State are also smaller when mature.

Sex	Length	Height	Diameter	Locality
♀	88	x	55	x 45mm—(Black R., Williamsville)
♂	75	x	54	x 42mm—(White R., Hollister)

MISCELLANEOUS REMARKS:—This subspecies is only found in the Southwest. For this State it is definitely reported by Mr. Walker for the Black River., Popular Bluff. The writer collected some of these forms of *ventricosa* from the same stream a few miles north. The Black is a metropolis for *ventricosa* where it is found in all forms, since this species is liable to intergrading—*satura* being one of these intergradations. Yet its rayless character (like that of *capax*) would make it worthy of a name.

Genus **Truncilla** Rafinesque.(Type, *Truncilla triqueter* Rafinesque).1819—*Truncilla* Rafinesque, Jl. de Phys. Chim. et Hist. Nat. pp. 427.

ANIMAL CHARACTERS:—Branchial opening densely set with papillae; anal crenulated; supra-anal well separated from the anal by a definite mantle connection; inner laminae of inner gills entirely connected with the visceral mass; outer gills greatly tapering anteriorly; palpi very small, post-dorsal margins entirely free; color of soft parts grayish, posterior margins of mantle black. Marsupia kidney-shaped, distended transversely as well as ventrad when gravid; formed by many ovisacs that occupy the posterior section of outer gill and extend down from the ventral edge of the original sterile gill in blunt, beaded unpigmented structures in state of gravidity; conglomerates not solid; glochidium medium in size, semicircular, hinge line very long, length about the same as height; post-ventral edge of marsupium doubled, the inner edge remote from outer forming a peculiar compartment as the highest specialization for the respiration of the embryos.

SHELL CHARACTERS:—Female shell very distinct from that of male, with a strong inflation or projection (marsupial expansion) in the post-ventral region which so changes its position and form that it assumes very many strange shapes; male shell not so modified post-ventrad, however, nodulous expansions do appear in some species; shell of either sex small, usually narrowly rounded in front much thicker anteriorly; beaks rather full, comparatively large, sculptured by double-looped ridges, usually obscure; epidermis yellowish or brownish, rayed with numerous fine green lines; cardinals and laterals usually single (or faintly double) in right valve, double in left; branchial cavity deep, basin-like; nacre white or bluish.

MISCELLANEOUS REMARKS:—This remarkable genus is the most modern due to the best possible adaptation to reproduction both as to the morphology of shell and soft parts. This correlation of the physiology to the morphology is best seen in the greatest specialization of the reproductive structures of the animal. Recognizing that the most recent classification of the *Unionidae* is based primarily upon the modification of the marsupium and that the genus *Truncilla* has carried out this sexual differentiation to the

greatest extent, Walker (1910c pp. 75-81) gives us the following systematic arrangement of *Truncillae* on the basis of reproduction:

- 1.—*Perplexa*—Group.—Marsupial expansion occupies the whole post-ventral area of shell.
- 2.—*Triquetra*—Group.—Marsupial expansion formed by the inflation of the post-umbonal ridge.
- 3.—*Foliata*—Group.—Marsupial expansion anterior to post-umbonal ridge and more or less separated from it.

These groups may in turn be subdivided because of the different forms and shifting position of the sexual expansion. The first and third groups are represented in this State by two new species, discovered by the writer in South Missouri streams, and their novelty acknowledged by Mr. Frierson of Frierson, Louisiana.

***Truncilla curtisii* Frierson and Utterback. New Species.**

("Curtis' Shell.")

Pl. VI, Figs. 14a-d; Pl. XXVIII, Figs. 109 A—D.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely bordered with papillae; anal crenulated; supra-anal high, rather small, separated from anal by moderately short mantle connection, mantle border here spotted; inner laminae of inner gills entirely connected to visceral mass; palpi very small connected only by their anterior base which is remote from the anterior attachment of pointed outer gill; color of soft parts grayish except the blackish mantle edge at siphonal openings.

REPRODUCTIVE STRUCTURES:—Marsupium very broad, rounded ventrad, kidney-shaped, ovisacs several, distinct occupying posterior half of outer gills and distended into beaded, unpigmented structures along ventral edge when gravid; conglutinates broken masses; glochidia unknown as only specimens gravid with early embryos have been obtained; inner mantle edge of female antero-ventrad to branchial opening drawn in toward the interior of shell forming a chamber.

SHELL CHARACTERS OF FEMALE:—Obovate, lacks flattened area of the disc, slightly emarginated just below post dorsal line; epidermis cloth-like, brownish-yellow, finely and obscurely radiate

all over; nacre white; the antero-extra pallial layer remarkably thickened; anterior muscle scars deep, the posterior lightly impressed and confluent; the pallial line reflected upward and inward in the post-half; cardinals double in each valve, small, high, acuminate, sulcate; sexual expansion thin, swollen, slightly radiately and concentrically ridged, denticulate on edge.

SHELL CHARACTERS OF MALE:—Shell much the smaller of the two (so far as noticed); rounded before, sinuous below, widely biangular behind, flattened over the umbones and to the post-base; post ridge widely double.

Beaks of both sexes remarkably heavily ridged, inclined to be doubly looped, but obtusely so in front, ridges heavy behind running downwards and backwards to the umbonal ridge. The earlier growth of the shell when looked at through a lens resembles in a striking way a diminutive *Amblema plicata* (Say.)

Sex	Length	Height	Diameter	Locality
♀	33 x	23 x	15 mm—	(White R., Hollister, Mo.)
♂	22.5 x	19.5 x	13.5 mm—	(White R., Hollister, Mo.)
♀	26.5 x	18.5 x	14 mm—	(White R., Hollister, Mo.)

MISCELLANEOUS REMARKS:—The position of this interesting species is exactly between *capsaeformis* Lea and *biemarginatus* Lea. From *capsaeformis* our species differs in the sexual enlargement being of the same general body color and in being more expanded or swollen in the middle and therefore not so regularly fan-shaped as in *capsaeformis* and our shell is not so regularly rounded behind. From *biemarginata* our species may be differentiated by its lack of pronounced angles and ridges of the former and by our species being much smaller and thinner and from its general almost solid piece color. *Our species differs most remarkably in the heavy beak sculpture.* From *deviatus* Anthony our shell similarly differs in color; and the sexual swelling is not so far protruded behind. A specimen of *deviatus*, recently procured, shows this species to have beaks nearly as heavily corrugate as our species and not, as Anthony supposed, nearly smooth as in *capsaeformis*. The presence of a form so intimately resembling those of the East Tennessee mountain streams in Missouri is of great interest.

The shell was taken by the co-author, W. I. Utterback, in the White River, Hollister, Mo., Aug. 26, 1913, and is named in honor of Dr. W. C. Curtis of the Department of Zoology, Univer-

sity of Missouri. The type shells, which are line-drawn and also photographed herewith, are now in the possession of Mr. Utterback.

Truncilla Lefevrei¹ Utterback. New Species.

("Lefevre's Shell.")

Pl. VI., Figs. 13 a—d; Pl. XXVIII., Figs. 108 A—D.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening thickly papillose; anal crenulated; supra-anal moderately connected to anal; outer gills shorter and only half as wide as inner gill, inner laminae entirely connected to visceral mass; outer gills drawn up high and pointed anteriorly forming wide gap between palpi and anterior attachment; palpi small, free their whole dorsal length; color of soft parts dingy white with squarish, blotched mantle edge around anal and supra-anal openings and solid blackish border at branchial opening.

REPRODUCTIVE STRUCTURES:—Marsupium formed by several ovisacs arranged in a kidney-shape, which, when gravid, extend down to the edge of inner gills forming a plain beaded border on the ventral edge; inner mantle edge anterior-ventrad to branchial opening drawn over into the interior of shell forming a compartment evidently as a water reservoir; no conglomerates nor glochidia observed.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, narrowly rounded before, solid anteriorly, thin posteriorly; general shape of both sexes ovate-trigonal; epidermis brownish-yellow, smooth, with fine, continuous rays; beaks rather large, full, too eroded to make

¹As may have been noted, the author has departed from the accepted Code of Nomenclature on *Naiades* in so far as to employ the *initial capital* for all names of those Species and Sub-Species derived from the *names of persons* when used substantively in both their respective binomial and trinomial forms. Although this action may seem somewhat presumptuous, yet the departure is surely justifiable on the grounds of efforts to be more consistent with clearness as to the nominal derivation and especially with the Latin and Greek etymology or diction. In this regard the suggestion of the Editor has been followed and reference would be made to his comments on "Proper Publication" (Am. Mid. Nat., Vol. IV., No. 3, pp. 95 and 96).

out sculpture. Female shell broader posteriorly, *marsupial expansion* formed post-ventrad, above basal line *just anterior to post-umbonal ridge* and bounded ventrad by a furrowed rest line. Male shell more trigonal in shape with post-umbonal ridge rather biangulated and with a very slight radial furrow in front; dorsal ridge rather prominent.

Internal structure of both sexes about the same except a higher mantle line in the female shell; cardinals double in both valves; laterals single in right, double in left; branchial cavities deeply basin-like; nacre blue with a tinge of yellow in the branchial cavity, iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♀	32	x 21	x 15mm—	(Black River, Williamsville)
♂	26.5	x 18	x 14mm—	(Black River, Williamsville)

MISCELLANEOUS REMARKS:—Although this rare Species has been found only in one locality yet a sufficient suite of shells was secured to establish its novelty. One specimen was obtained gravid with ova, yet it was sufficiently, although briefly, described afield before it was lost as often results in a rush of field work. At first the author was inclined to call this Species *T. triquetra*, but comparisons to actual shells of typical *triquetra* show that it is placed in the third group of *Truncilla* which is characterized by the marsupial expansion formed by the inflation just anterior to the post-umbonal ridge not extending below the basal line and in which group *triquetra* is not classed. *Lefevrei* differs from the *arcaeformis* of Lea in not possessing a radial depression in front of the post-dorsal ridge and in not having such a prominently curved post-umbonal ridge and also in not possessing such coarse hinge teeth. This new and most modern Species is dedicated to Dr. George Lefevre of the Department of Zoology in the University of Missouri. The discovery of this new Species from the Black River, Williamsville, Missouri, and also of the new *Truncilla*, *Curtisii* Frier-son and Utterback, from the White River, Hollister, this State, and, being the only completely described *Truncillae* west of the Mississippi, it seems fitting that these should bear the names of the two associate authors and instructors who have contributed so much to the science of the *Naiades* in their monumental work, "*Studies on the Reproduction and Artificial Propagation of Fresh-Water Mussels.*"

(THE END)

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ERRATA.

(For Serial Numbers of Utterback on *The Naiades of Missouri*, Vol. IV.)

Some errors have been due partly to improper and insufficient corrections of the MS. which originally followed Lindahl's "Orthography of the Names of *Naiades*,"—an article that adheres strictly to the International Code. Most of the other errors are the typographical mistakes that usually escape even the most careful proof-reading.

VOL. IV., No. 3:—

Page 47, line 19, for "marsupial" read "marsupia"; line 40, for "*Magnonaias*" read "*Megalonaias*"; line 44, for "*Schoolcraftensis*" read "*schoolcraftensis*."

Page 49, line 7, for "Genus XII" read "Genus XIII"; line 19, for "*Ferussacianus*" read "*ferussacianus*"; line 29, for "Genus VXII" read "Genus XVII".

Page 50, line 39, for "*texensis*" read "*texasensis*."

Page 51, line 12, for "*Curtisi*" read "*Curtisii*" (This latter inflection really should occur for all Latinized substantives derived from names of persons terminated by a consonant).

VOL. IV, No. 4:—

Page 101, line 25, insert "inner" before "usually."

Page 102, line 11, for "*Unionae*" read "*Unionidae*"; line 18, for "The connection" read "the usual disconnection."

Page 103, line 32, for "*F. trigona*" read "*F. undata trigona*".

Page 104, line 4, omit comma after "hermaphroditic"; line 12, for "Plates I and I" read "Plates I and II".

Page 111, line 21, insert next line below this reference:—"Pl. XV., Figs. 34A and B".

Page 115, line 19, insert comma after "p. 71"

Page 118, line 6, for "*raripliplicata*" read "*rariplicata*"

Page 119, line 24, for "these fact" read "this fact"; line 27, for "*quintardi*" read "*Quintardii*" (All other errors regarding *Quintardii* read as corrected here).

Page 126, for Text-Fig. 3 A transpose "AN" and "PO".

Page 127, line 9, for "expecially" read "especially"; line 20, between "very" and "profusely" insert "compressed and".

Page 128, line 3, for "sulpture" read "sculpture"; line 13, separate "glochidia" and "lying"; insert next line below:—"7.—No undulations in juvenile and adolescent shell as in *Amblemae*".

Page 130, line 10, for "charasterized" read "characterized".

Page 131, line 4, for all statements of "*Quadrula pustulosa* (Lea)" read "*Quadrula bullata* (Raf.)" as mentioned in the Foot-note for this page.

Page 136, line 38, for "*Udio*" read "*Unio*".

Page 137, line 22, for "tacytictic" read "tachytictic".

Page 143, line 2, for "tha" read "than".

Page 147, line 28, for "*wardii*" read "*Wardii*" (All other errors regarding the capitalization of "*Wardii*" read as corrected here).

Page 149, line 35, insert comma after "marsupial".

Page 150, line 37, for "wiite" read "white".

Vol. IV, No. 5:—

Page 184, line 17, for "state" read "State" (All other errors in the use of this word when its antedecedent is geographic, e. g., "Missouri," correct as read here).

Page 187, line 25, for "*Pleruobemae*" read "*Pleurobemae*".

Page 191, line 39, omit "Am."

Page 192, line 30, between "*catillus*" and "by" insert "not only" and between "but" and "its" insert "also by"; line 35, between "had" and "been" insert "also".

Page 195, line 18, for period use a comma after "North Missouri".

Page 196, line 2, of Foot-note for "groupp" read "group".

Page 199, line 13, for the first word, "of" read "or"; line 21, for "used" read "use".

Page 204, line 10, for "papli" read "palpi".

Vol. IV, No. 6:—

Page 245, in Text-Fig. 4, for "M" on inner gill read "I".

Page 248, line 36, for "umbona" read "umbonal"; line 39, for "vavles" read "valves".

Page 251, line 2, for "climed" read "claimed"; line 27, for "*Ptero-sygna*" read "*Pterosyna*".

Sub-Family III LAMPSILINAE:—

Marsupium differentiated with special ovisacs mostly arranged posteriorly near the post-ventral mantle margin specialized with crenulations, papillae, etc.; only outer gills marsupial; glochidium *Lampsilis Type*; *bradytictic*.

Proptera Type
(Intermediate to modern form) of glochidium: Axe-head shape, spined-spineless.

The *Spineless* glochidia are followed in the adult life by perfect and *complete* hinge teeth.

Lampsilis type, (Modern-Form) of glochidium:—Suboval-subelliptic, spineless.

This reversion of the modern form of glochidium to that of the primitive very strikingly shows that *atavism* characteristic of the principles of evolution.

Sub-Family II ANODONTINAE:—

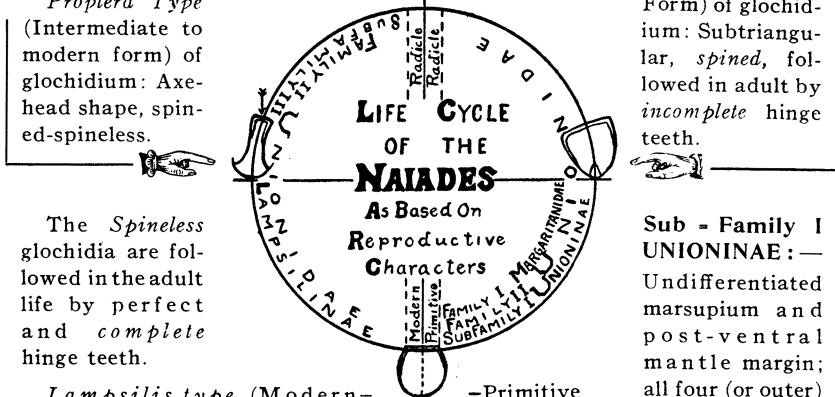
Marsupium differentiated with lateral water tubes when gravid; post-ventral mantle margin undifferentiated; all four gills marsupial; glochidium *Anodonta Type*; *bradytictic*.

Anodonta Type
(Intermediate Form) of glochidium: Subtriangular, *spined*, followed in adult by *incomplete* hinge teeth.

Sub - Family I UNIONINAE:—
Undifferentiated marsupium and post-ventral mantle margin; all four (or outer) gills marsupial; *tachytictic* species; glochidia *Lampsilis Type*.

Family I MARGARITANIDAE:—

Marsupium more primitive than that of Family II; post-ventral mantle margin undifferentiated; all four gills marsupial; glochidium *Lampsilis Type*; *tachytictic*



Page 252, line 19, for "bue" read "blue".

Page 254, line 27, for the adverb. "ventrad" read as adjective, "ventral".

Page 255, line 33, insert next line below:—" (Type, *Lastena ohiensis* Raf.);" line 36, separate "outer" and "and".

Page 256, line 26, for "p." read "Pl."; line 36, for "pericardinal" read "pericardial".

Page 257, line 10, omit comma after "distinct" and supply after "veining".

Page 258, in Text-Fig. 7, transpose "AN" and "PO".

Page 262, line 33, for "brownsh" read "brownish-yellow".

Page 263, line 22, for "moss" read "mass"; line 33, for "mosses" read "masses".

Page 268, line 35, insert next line below:—" (Type, *Anodonta ferusaciana* Lea)"

Page 269, line 6, omit "External Structures"; line 18, add "about" after "being".

Page 270, line 30, insert next line below:—" (*Alasmidonta undulata* Say)".

Page 273, line 26, for "known" read "shown".

VOL. IV, No. 7:—

Page 312, line 10, before "containing" insert "each" and for comma use semi-colon after "larvae" and also omit "are"; line 11, omit "situated"; line 12, for "min" read "mm"; line 16, for "obtusely" read "obtuse".

Page 317, line 34, for "*facsiolaris*" read "*fasciolaris*"; as indicated in Foot-note for this page, for all statements of "*Ellipsaria clintonensis* (Simpson)" read "*Ellipsaria occidentalis* (Conrad)".

Page 318, line 7, for period after "p. 301" use semi-colon.

Page 320, line 8, use semi-colon after "interdentum".

Page 321, line 22, for "nodulat" read "nodulated".

Page 324, line 2, for "J" read "Jl."; line 16, omit comma after "height".

VOL. IV, No. 8:—

Page 343, line 30, for "*pleasii*" read "*Peasii*"; (do. page 344, line 29; do. page 345, line 20); line 32, for "clolored" read "colored".

Page 345, line 26, for "*utterbackii*" read "*Utterbackii*"; (do. line 31).

Page 348, line 18, insert "IX" after "pl".

Page 352, line 15, for "*simpsoni*" read "*Simpsoni*"; (do. page 387, line 3).

Page 353, line 38, for "bysuss" read "byssus".

VOL. IV, No. 9:—

Page 387, line 34, for "*teniussimus*" read "*tenuissimus*".

Page 391, line 28, for "*Lamack*" read "*Lamarck*".

Page 392, line 14, for "more" read "not" and for "not" read "nor".

Page 395, line 34, for "*proptera*" read "*Proptera*".

Page 396, line 20, for "*tecxasensis*" read "*texasensis*".

Page 400, line 6, for "central" read "center"; after line 10 supply the following deletion from text:—

SHELL CHARACTERS:—Shell elliptical, small or medium, beak sculpture rather double-looped or distinctly sinuate with posterior sinuation somewhat open.

ERRATA.

(PLATES I—XXVIII.)

Pl. I, Fig. 2, for "vavel" read "valve".

Pl. II, Fig. 5a, Supply label 4, i. e., "Extreme dorsal point."

Pl. V, Fig. 12b, for "*Utterbacki*" read "*Utterbackii*"; do. Pl. XX, Figs. 63 A—D.

Pl. VI, Figs. 14 a—d, for "*Curtisi*" read "*Curtisii*"; do. Pl. XXVIII, Figs. 109 A—D.

Pl. IX, Fig. 19, After "feeding" supply comma and "respiring".

Pl. XIII, Fig. 26, Supply "-Hundred" after "One;" do. Pl. XXVI, Fig. 90.

Pl. XVI, Figs. 38 A—D, for "*Quintardi*" read "*Quintardii*".

Pl. XIX, Fig 52, for "*cylindirca*" read "*cylindrica*".

Pl. XXV, Fig. 81, for "*clintonesnsis*" read "*clintonensis*".

Pl. XXVIII, Fig. 107, for "*ventricoas*" read "*ventricosa*".

||CLEISTOGAMOUS FLOWERS IN THE PANSIES.

BY J. A. NIEUWLAND.

In a former article¹ where reference was made to the presence or absence of cleistogamous flowers in certain groups of violets it was supposed that the pansies were devoid of this peculiar form of self-fertilization. For more than a year we have suspected the possibility of ceistogamay in certain members of the Mnemion group, and particularly in *Viola Rafinesquii*, Greene. Dr. Greene himself first called our attention to the fact that he believed the first flower that appeared on the young plant in spring is "apetalous." Ever since then we have sought an opportunity of examining young plants of *V. Rafinesquii* in order to determine their presence or absence. Such a chance was offered for the first time

¹Am. Mid. Nat. III. 207 et seg. (1914.)